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## WATER PUMP AND METHOD OF CLOSURE

## TECHNICAL FIELD

**[0001]** This invention relates to automotive engine water pumps and, more particularly, to methods of closing an impeller assembly opening.

## 5 BACKGROUND OF THE INVENTION

**[0002]** An automotive engine water pump is commonly provided with a housing having an assembly opening for inserting an impeller assembly into the housing. A cover is provided to close the opening and may be secured by screws and sealed by an o-ring seated in a groove of the housing  
10 or cover to prevent leakage of the engine coolant. Machining of the housing and/or cover and assembly of the cover, screws and o-ring to the housing adds complexity and cost to the pump.

**[0003]** A simplified automotive water pump assembly not requiring o-rings or machined grooves is desired to reduce assembly time, complexity,  
15 and costs.

## SUMMARY OF THE INVENTION

**[0004]** The present invention provides a simplified water pump. The pump having a housing with an assembly opening for installation of an  
20 impeller assembly. The opening is defined by a continuous axial inner retention surface and a radial outer surface. The opening is closed by a plug formed of sheet metal having a generally radial closure portion surrounded by a continuous axial flange connecting with a radial lip.

**[0005]** After the impeller assembly is installed within the housing, an  
25 adhesive is applied to the axial flange of the plug or the inner retention surface of the housing. The plug is then pressed into the assembly opening.

As the plug is pressed into the opening, the axial flange is pressed inward toward the axis of the plug to create a press fit that retains the plug in the housing. When the plug is fully pressed into the opening, the radial lip of the plug engages the radial outer sealing surface of the housing to provide a stop for the plug.

[0006] Once the plug and housing are assembled, the adhesive is allowed to set, creating a seal that prevents leakage of pressurized coolant and increases the retaining force of the plug closing the opening.

[0007] These and other features and advantages of the invention will be more fully understood from the following description of certain specific embodiments of the invention taken together with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a cross-sectional view of an automotive water pump having an assembly opening closure according to the present invention; and [0009] FIG. 2 is a cross-sectional view of a plug forming the closure of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] Referring now to FIG. 1 of the drawings in detail, numeral 10 generally indicates a water pump for an automotive engine. The water pump has a housing 12 internally defining a flow chamber 14 containing a rotatable impeller 16. The impeller 16 is fixed on a drive shaft 18 forming an assembly rotatable in the housing 12. An exterior portion 20 of the drive shaft 18 mounts a pulley 22 adapted to be driven by an accessory drive belt for pumping pressurized coolant through an engine cooling system.

[0011] For assembly purposes the housing 12 has an impeller assembly opening 24 adjacent the impeller 16. The opening 24 is defined by a radial outer surface 26 and a continuous axial inner retention surface 28.

[0012] The opening 24 is closed by a disk shaped plug 30 shown in FIG. 2 and configured to fit in the assembly opening 24 of the housing 12. The plug 30 is formed of sheet metal and includes a radial closure portion 32 surrounded by a continuous axial flange 34 connected outwardly with a radial lip 36. The axial flange 34 is sized to be press fitted into the inner retention surface of the opening 24.

[0013] Before assembly a preferably anaerobic adhesive 38 is applied to the adjoining flange and retention surfaces of the plug and the housing to form a hydraulic seal and to increase the retention of the plug within the opening. Preferably, the adhesive 38 is applied to the axial flange 34 of the plug 30. Alternatively, the adhesive 38 may be applied to the inner retention surface 28 of the housing. An anaerobic adhesive which hardens between the surfaces in the absence of air is preferred.

[0014] Referring now to FIG. 1, after the impeller assembly is installed within the housing, the plug 30 is pressed into the opening 24 of the housing 12. As the plug 30 is pressed into the opening 24, the axial flange 34 of the plug is pressed inward toward the axis 40 of the plug to create a press fit that retains the plug 30 in the housing 12. When the plug 30 is fully pressed into the housing 12, the radial lip 32 engages the radial outer surface 26 of the housing to provide a stop for the plug to prevent the radial closure portion 36 from contacting the impeller 16. Once the plug 30 and housing 12 are assembled, the adhesive is allowed to set, creating a seal that prevents leakage of the pressurized coolant during engine operation and increases the retaining force of the plug in the opening.

[0015] While the invention has been described by reference to certain preferred embodiments, it should be understood that numerous changes could be made within the spirit and scope of the inventive concepts described. Accordingly, it is intended that the invention not be limited to the disclosed embodiments, but that it have the full scope permitted by the language of the following claims.